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Crystallographic and Metacrystallographic Groups

edited by **W. Opechowski,** *Department of Physics, University of British Columbia, Vancouver, BC, Canada*

1986. viii + 628 pages Price: US $146.00/Dfl.365.00
ISBN 0-444-86955-7

This book consists of five parts. In Part I one will find those definitions and general theorems of elementary group theory which are needed in the remaining four parts. In Part II the Euclidean group and the Newton group are introduced and their structure is discussed. In Part III a systematic survey of all finite and infinite discrete subgroups of the Euclidean group is given and not only of the crystallographic groups. How the latter groups (among them in particular, space groups) are used for a classification of crystals is discussed in detail and illustrated with examples.

Part IV is devoted to metacrystallographic groups which are introduced as invariance groups of functions defined on crystals regarded as discrete point sets in space and in particular, to magnetic groups (which are certain subgroups of the Newton group), spin groups and colour groups. The role played by magnetic groups and spin groups in the classification of magnetically ordered crystals is described and illustrated with examples. A digression into quantum mechanics is made where co-representations of groups are introduced in connection with magnetic groups. Some other metacrystallographic groups (for example, colour groups) are also discussed. Part V deals with superspace groups, which are certain space groups in Euclidean spaces of dimension higher than three, and with the way in which these groups are used for a description and classification of incommensurate modulated crystals.

CONTENTS: Preface. **Part I. Concerning the mathematical language used in this book.** 1. Sets, mappings, classifications and algebraic structures. 2. A selection of definitions and theorems concerning groups.
Part II. Affine and Euclidean groups, the Newton group. 3. Leading to space-time. 4. Linear and affine groups, orthogonal and Euclidean groups, gross classification of groups of isometries. 5. Matrix representation of groups. 6. Euclidean groups $\mathcal{E}$ (3), $\mathcal{E}$ (2), $\mathcal{E}$ (1) and the Newton group $\mathcal{E}_{(s)}(3) \times \mathcal{E}_{(t)}(1)$.
Part III. Discrete point sets in space and discrete groups of isometries; in particular, crystallographic groups. 7. Leading to crystallographic groups. 8. Lattice groups and point lattices. 9. Space groups. 10. Classification of crystals by means of space groups. 11. Decomposable discrete groups of isometries.
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MODERN PROBLEMS IN CONDENSED MATTER SCIENCES

Unitary Transformations in Solid State Physics

Volume 15

by **M. Wagner,** *Institut für Theoretische Physik,*
Universität Stuttgart, Stuttgart, FRG

1986 xvi + 346 pages Price: US $90.00/Dfl. 225.00 ISBN 0-444-86975-1
Subscription price: US $76.50/Dfl. 191.25

The main emphasis of this book is on the practical application of unitary transformations to problems in solid state physics. This is a method used by the author and his collaborators for years in the field of nonadiabatic electron-phonon phenomena where the Born-Oppenheimer approximation is no longer applicable. This book is intended as a tool for those who want to apply unitary transformations quickly and on a more elementary level and also for those who want to use this method for more involved problems.

The book is divided into 6 chapters. The first three chapters are concerned with presenting quick applications of unitary transformations and chapter 4 presents a more systematic procedure. The last two chapters contain the major known examples of the utilization of unitary transformations in solid state physics, including such highlights as the Frölich and the Foulton-Gouterman transformations. The book is supplemented by extended tables of unitary transformations, whose properties and peculiarities are also listed. This tabulated material is unique and will be of great practical use to those applying the method of unitary transformations in their work.

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Volume 7

edited by KARL A. GSCHNEIDNER, Jr. *and* LEROY EYRING

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